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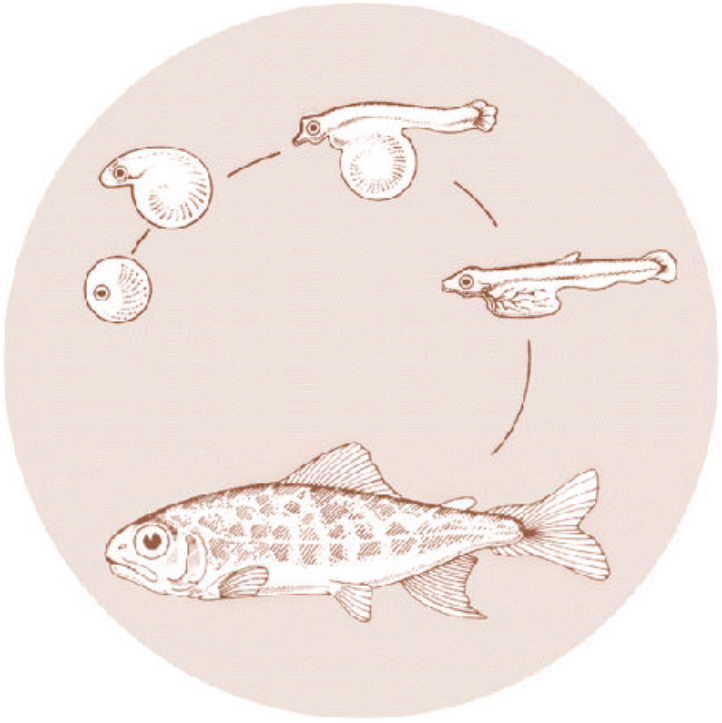
MANCHESTER SPRING CHINOOK BROODSTOCK PROJECT

Progress Report 1998-1999



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MANCHESTER SPRING CHINOOK BROODSTOCK PROJECT

Progress Report, 1998 - 1999

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INTRODUCTION

In spring 1995 the Idaho Department of Fish and Game (IDFG) and the Oregon Department of Fish and Wildlife (ODFW) initiated captive broodstocks as part of conservation efforts for ESA-listed stocks of Snake River spring/summer chinook salmon (*Oncorhynchus tshawytscha*). The need for this captive broodstock strategy was identified as critical in the National Marine Fisheries Service (NMFS) Proposed Recovery Plan for Snake River Salmon. These captive broodstock programs are being coordinated by the Bonneville Power Administration (BPA) through the Chinook Salmon Captive Propagation Technical Oversight Committee (CSCPTOC).

Oregon's Snake River spring/summer chinook salmon captive broodstock program currently focuses on three stocks captured as juveniles from the Grande Ronde River Basin: the upper Grande Ronde River, Catherine Creek, and the Lostine River. Idaho's Snake River program includes three stocks captured as juveniles from the Salmon River Basin: the Lemhi River, East Fork Salmon River, and West Fork Yankee Fork. The majority of captive fish from each stock of the Grande Ronde Basin will be grown to maturity in freshwater at the ODFW Bonneville Hatchery. A minority of the Salmon River Basin stocks will be grown to maturity in freshwater at the IDFG Eagle Hatchery. However, the IDFG and ODFW requested that a portion of each group also be reared in protective culture in seawater.

In August 1996, NMFS began a BPA funded project (Project 96-067-00) to rear Snake River spring/summer chinook salmon captive broodstocks in seawater at the NMFS Manchester Marine Experimental Station. During 1997-1999, facilities modifications were undertaken at Manchester to provide secure facilities for rearing of these ESA-listed fish. This included construction of a building housing a total of twenty 6.1-m diameter fiberglass rearing tanks, upgrade of the Manchester salt water pumping and filtration/sterilization systems to a total capacity of 5,670 L/min (1,500 gpm), and installation of an ozone depuration system. Initial activitiesd releated to Project 96-067-00 are described in Flagg et al. 1997, 1998. The current report summarizes NMFS activities on the Snake River spring/summer chinook salmon captive

broodstock program at Manchester during 1998-1999. In addition to husbandry activities, NMFS efforts also included participation in the CSCPTOC.

I. SUMMARY OF ACTIVITIES TO 12/31/99

Element 1. Facilities upgrade.

Smolt-to-adult captive rearing of successive year-classes of Oregon and Idaho stocks of Snake River spring/summer chinook salmon at Manchester required significant facilities modification and upgrade. Both ODFW and IDFG requested that each year-class of each stock be maintained in a separate 6.1-m diameter fiberglass rearing tank. Thus, a total of 20 6.1-m diameter fiberglass rearing tanks housed in a secure building was required to carry out the program at Manchester. In addition, the project necessitated complete upgrading of the Manchester salt water pumping and filtration/sterilization systems to a total capacity of 5,670 L/min (1,500 gpm) and installation of an ozone depuration system. This construction was a cooperative effort between NMFS and BPA. BPA provided engineering services for facility design and purchased the major building, water processing, and water depuration components. NMFS provided engineering support and shop services for non-vendor-supplied facilities construction and equipment installation.

As of the end of December 1999, all major construction components for the Manchester facility have been completed. NMFS is currently completing installation of a backup generator system for the facility.

Element 2. Endangered Snake River spring/summer chinook salmon captive broodstock rearing.

Approach

The captive broodstock concept differs from that used in conventional hatcheries in that fish of wild origin are maintained in captivity throughout their life (see Flagg and Mahnken 1995 for

review of captive broodstock technology). Offspring from captive broodstocks are released to supplement wild populations. The high fecundity of Pacific salmon, coupled with potentially high survival in protective culture, affords an opportunity for captive broodstocks to produce large numbers of juveniles in a single generation for supplementation. The relatively stable egg supply provided through a captive broodstock program should help ensure success of supplementation efforts for depleted stocks.

For these programs, Idaho proposed an approach, termed captive rearing, that involves rearing broodstock in captivity to adulthood and releasing them back into their natal streams to spawn naturally. This approach is untried and it is unclear whether hatchery-reared adults will retain the characteristics necessary for successful spawning in the wild. Because success of achieving wild-fish attributes is uncertain, it is possible that in some years gametes may also be returned to Idaho to help maintain these gene pools. Oregon has proposed a conventional captive breeding approach where maturing fish are returned to Oregon, spawned, and the resultant eggs used to help maintain and restore these gene pools.

NMFS is providing daily staffing for protective culture of Snake River spring/summer chinook salmon at Manchester. Electronic security and facilities monitoring is provided at all times. Husbandry requirements are detailed in ESA Section 10 Propagation Permits for rearing of Idaho (Permit 972) and Oregon (Permit 973) stocks of ESA-listed Snake River spring/summer chinook salmon. The fish are being reared using standard fish culture practices and effective therapeutics. Generally, juvenile-to-adult rearing density in the tanks is maintained at under 8 kg/m3 (0.5 lbs/ft3) during most of the culture period; however, fish density may range to 15 kg/m3 (1.0 lbs/ft3) at maturity. Fish are fed a commercial ration (e.g., Moore Clark[1]) during culture. Mortalities are examined to determine cause of death. Select mortalities are frozen or preserved as appropriate for

[1] Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

genetic or other analyses. NMFS is coordinating exact details of rearing parameters for these fish with ODFW and IDFG through the CSCPTOC process.

In May-June 1996-1999, IDFG and ODFW transferred groups of 1994-, 1995-, 1996- and 1997-brood Snake River spring/summer chinook salmon smolts to Manchester for rearing to adult (Table 1). The 1994- and 1995-brood fish were initially transferred to, and held in, 4.1-m diameter circular fiberglass tanks supplied with pumped, filtered, and UV-sterilized seawater. These fish were then transferred to the 6.1-m tanks in November 1997 for rearing to adult. The 1996- and 1997-brood smolts were transferred directly into 6.1-m tanks in spring 1998 and 1999, respectively. To date, survival during culture has been very good (53-99%) for all except two of the groups (Table 1). Both the 1996-brood East Fork Salmon River and the 1996-brood Yankee Fork Salmon River (ID) stocks were identified as positive for Bacterial Kidney Disease (BKD) prior to their transfer to Manchester in spring 1998. BKD is extremely difficult to treat effectively once it is established in a population. As a consequence, all of the East Fork stock, and virtually all (97%) of the West Fork Yankee Fork stock were lost to this disease, despite aggressive antibiotic treatments.

Through 1999, NMFS has transferred a total of 201 adult fish from the captive broodstocks to Idaho. The majority of these fish have been released by IDFG as prespawning adults to their natal drainages. Fish have been observed to survive and spawn after release (Paul Kline, IDFG, Eagle, ID, pers. commun.). Information on success of releases of captive broodstock chinook in Idaho is available through IDFG. NMFS has also transferred a total of 521 adult fish from the captive broodstocks to ODFW. These fish were retained at ODFW hatcheries and spawned. These spawned captive broodstock animals have been observed to produce viable eggs (n = 435,000) for use in recovery programs (Willie Noll, ODFW, La Grande, OR, pers. commun). Information on success of captive broodstock chinook spawned in Oregon is available through ODFW.

EXPECTED RESULTS

Because of the critically low population size, captive broodstocks appear to offer the only hope to maintain critical stocks of Snake River spring/summer chinook salmon while habitat improvements are underway. Maintaining geographically separate captive brood populations will help reduce the risk of catastrophic loss of these gene pools from mechanical failure, human error, or disease. In upcoming years, the Snake River spring/summer chinook salmon captive broodstock programs should provide hundreds of adults and hundreds of thousands of eggs for use in recovery efforts.

References

Flagg, T. A., and C. V. W. Mahnken (editors). 1995. An assessment of captive broodstock technology for Pacific salmon. Report to Bonneville Power Administration, Contract DE-AI79 93BP55064.

Flagg, T. A., M. R. Wastel, and W. C. McAuley. 1997. Manchester spring chinook broodstock project, progress report for 1996. Report to Bonneville Power Administration, Contract 96-BI-96441, 8 p.

Flagg, T. A., M. R. Wastel, and W. C. McAuley. 1998. Manchester spring chinook broodstock project, progress report for 1997. Report to Bonneville Power Administration, Contract 96-BI-96441, 7 p.

Table 1. Inventory records for Oregon and Idaho stocks of ESA-listed 1994-, 1995-, 1996-, and 1997-brood spring/summer chinook salmon being reared from smolt-to-adult in seawater at the NMFS Manchester Laboratory, December 1999.

Stock	Number transferred	Cumulative mortality	Precocious males[b]	Jacks[c]	Adults[c]	Number remaining	Survival[a] (%)[d]
			1994-BROOD				
IDAHO							
Lemhi River	75	28	4	2	39	2	62.7
Yankee Fork	87	41	1	17	26	2	52.9
East Fork	75	26	4	16	26	3	65.3
OREGON							
Catherine Creek	167	33	15	38	76	5	80.2
Lostine River	160	70	5	20	62	3	56.3
			1995-BROOD				
IDAHO							
Lemhi River	69	12	2	14	21	20	82.6
OREGON							
Catherine Creek	156	68	6	24	22	36	56.4
Lostine River	149	45	6	46	36	16	69.8
			1996-BROOD				
IDAHO							
Lemhi River	110	45	0	12	--	53	59.1
Yankee Fork	60	58	0	--	--	2	3.3
East Fork	5	5	0	--	--	0	0.0
OREGON							
Catherine Creek	165	14	2	35	--	114	91.5
Lostine River	164	37	8	39	--	80	77.4
Grande Ronde	165	24	0	45	--	96	85.5

Table 1. Continued.

Stock	Number transferred	Cumulative mortality	Precocious males[b]	Jacks[c]	Adults[c]	Number remaining	Survival[a] (%)[d]
			1997-BROOD				
IDAHO							
Lemhi River	102	5	10	--	--	87	95.1
Yankee Fork	165	28	18	--	--	119	83.0
OREGON							
Catherine Creek	158	1	7	--	--	150	99.4
Lostine River	161	2	16	--	--	143	98.8
Grande Ronde	167	3	13	--	--	151	98.2

[a] Survival from seawater transfer.

[b] Precocious fish from Oregon stocks were transferred to the ODFW Bonneville Fish Hatchery and milt cryopreserved. Precocious fish from Idaho stocks were removed from population and assayed for pathology, for all brood years except 1997. Precocial males from brood year 1997 were returned to the IDFG Eagle Hatchery and used in recovery evaluation.

[c] Jacks, age 4, and age 5 adults from Oregon stocks were transferred to the ODFW Bonneville Fish Hatchery. Jacks, age 4, and age 5 adults from Idaho stocks were transferred to the IDFG Eagle Hatchery and used in recovery evaluations.

[d] Number of mortalities/starting number. Fish that survived to maturity are included as survivors.